IN THE CLAIMS

Claims 1 – 30 (Cancelled)

31. (Currently Amended) A ~~nozzle~~ system for vectoring a primary flow ~~of a fluid flowing through an enclosed volume, the nozzle being a 3-D nozzle and having an inside surface, the nozzle~~ by varying an effective throat or sonic plane within a ducted primary flow, comprising:

an opening for accepting the primary flow;

at least one primary injector located wherein said at least one injector is ~~a plurality of injectors with port openings arranged along the inside surface of the 3-D nozzle, each of the plurality of injectors adapted to expel an injection fluid in a direction within the enclosed volume, the direction~~ inclined to oppose the primary flow ~~of the fluid and approximately parallel to an intended vectoring~~ up-stream of said effective throat or sonic plane;

at least one supplemental injector wherein said at least one supplemental injector is located downstream of the at least one primary injector, wherein said at least one supplemental injector is inclined to oppose the primary flow, and wherein the at least one primary and supplemental injectors provide a flow field opposed to a subsonic portion of the primary flow in order to vector the primary flow; and

at least one controller operable to direct said at least one primary and supplemental injector to provide a flow operable to vary the effective throat or sonic plane.

32. (Currently Amended) The ~~nozzle of~~ system for vectoring a primary flow of Claim 31, ~~the nozzle~~ further comprising:

a physical throat, ~~the~~ within a duct, wherein the physical throat ~~comprising~~ comprises a region ~~within the nozzle~~ of lowest cross-sectional area, ~~the throat being situation~~ in ~~a path of~~ the primary flow ~~of the fluid~~.

33. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 32 wherein ~~the~~ a plurality of primary injectors is located proximate to ~~the~~ said physical throat.

34. Cancelled.

35. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim ~~34~~ 31 wherein ~~the plurality of~~ injectors ~~and the second plurality of injectors expel the injection~~ inject fluid asymmetrically, to ~~resulting in a change in a thrust~~ redirect ~~vector associated with~~ the primary flow ~~of the fluid, the change in the thrust vector lying within the~~ along an intended vectoring plane.

36. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 35 wherein ~~the~~ a plurality of primary and secondary injectors ~~and the second plurality of injectors~~ inject fluidic ~~expel the injection fluid in~~ pulses.

37. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 33, ~~the nozzle further comprising:~~ wherein a ~~second~~ plurality of secondary injectors ~~located proximate to the throat, the second plurality of injectors having port openings~~ are arranged ~~along the inside surface opposite of the plurality of injectors, each of the second plurality of injectors adapted to expel the injection~~ to inject fluid ~~in a second direction within the enclosed volume, the second direction inclined~~ to oppose the primary flow ~~of the fluid and approximately~~ and in parallel to the intended vectoring plane.

38. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 37 wherein the plurality of primary injectors and the ~~second~~ plurality of secondary injectors ~~expel the injection~~ inject fluid symmetrically, resulting in a change in a discharge coefficient in the nozzle.

39. Cancelled.

40. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 31 wherein ~~the injection~~ injected fluid ~~is a~~ comprises compressed gas.

41. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 31 wherein ~~the injection~~ injected fluid comprises fuel.

42. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 31, ~~the nozzle~~ further comprising:

~~the~~ at least one controller, operable to direct said at least one ~~of the plurality of injectors to expel the injection fluid~~ primary injector and/or said at least one supplemental injector.

43. Cancelled.

44. (Currently Amended) A method for vectoring a primary flow of fluid in a 3-D nozzle, ~~the 3-D nozzle having a throat, the throat comprising a region within the 3-D nozzle of lowest cross-sectional area, the throat being situated in a path of the primary flow of fluid, the method~~ comprising the steps of:

~~expelling~~ injecting fluid from a plurality of primary injectors ~~an injection fluid in a direction inclined to oppose the~~ opposed to a primary flow of the fluid and approximately parallel to an intended vectoring plane, the plurality of injectors located proximate to ~~the~~ a throat~~.~~;

injecting fluid from a plurality of supplemental injectors opposed to the primary flow wherein said second plurality of supplemental injectors are located downstream of the throat, and wherein the fluid injected by said primary and/or supplemental injectors varies or skews an effective throat or sonic plane of said 3-D nozzle.

45. Cancelled.

46. (Currently Amended) The method of Claim 44, ~~the method~~ further comprising:

expelling from a second plurality of injectors the injection fluid in a direction inclined to oppose the primary flow of the fluid and approximately parallel to an intended vectoring plane, ~~the second~~ wherein said supplemental plurality of injectors are located ~~approximate~~ proximate to the throat.

47. (Currently Amended) The method of Claim 44 wherein ~~the step of expelling comprises expelling in~~ fluid is injected by said primary and/or supplemental injectors in fluidic pulses.

48. (Currently Amended) The method of Claim 44 wherein the ~~injection~~ injected fluid ~~is~~ comprises a compressed gas.

49. (Currently Amended) The method of Claim 44 wherein the ~~injection~~ injected fluid ~~is a~~ comprises fuel.

50. Cancelled.

51. (Currently Amended) A ~~nozzle~~ system for vectoring a primary flow ~~of fluid, the primary flow of fluid flowing through an enclosed volume, the~~ comprising:

a nozzle having an ~~inside~~ inner surface and a throat, wherein the throat ~~comprising~~ comprises a region within the nozzle of lowest cross-sectional area, the throat being situated in a path of the primary flow of fluid ~~the nozzle comprising:~~;

a plurality of primary injectors ~~with port openings~~ arranged along the ~~inside~~ inner surface of the nozzle, the plurality of injectors arranged ~~such that the plurality of injectors are not aligned parallel to the path of the primary flow of fluid, each of the plurality of injectors adapted to expel an injection fluid in a direction within the enclosed volume, the direction inclined~~ to oppose the primary flow of fluid ~~and~~ in a first ~~approximately parallel to an~~ intended vectoring plane, and wherein said primary injectors skew an effective throat or sonic plane within said nozzle; and

at least one controller operable to direct said at least one primary and supplemental injector to provide a flow operable to vary the effective throat or sonic plane.

52. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 51 wherein the plurality of injectors is located proximate to the throat.

53. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 52, ~~the nozzle~~ further comprising:

a ~~second~~ plurality of supplemental injectors located downstream of the throat and arranged along the ~~inside~~ inner surface of the nozzle, ~~the second plurality of injectors arranged such that the second plurality of injectors are not aligned parallel to the path of the primary flow of fluid, each of the second plurality of injectors adapted to expel the injection fluid in a second direction within the enclosed volume, the second direction inclined~~ to oppose the primary flow ~~of the fluid and approximately parallel to the~~ in a second intended vectoring plane.

54. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 53 wherein the plurality of primary and supplemental injectors ~~and the second plurality of injectors expel the injection~~ inject fluid asymmetrically, resulting in a change in a thrust vector associated with the primary flow of the fluid, the change in the thrust vector lying within the first and/or second intended vectoring plane.

55. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 54 wherein the plurality of primary and supplemental injectors ~~and the second plurality of injectors expel the injection fluid in~~ inject fluidic pulses.

56. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim ~~52~~ 53, ~~the nozzle further comprising~~ wherein said supplemental injectors are:

~~a second plurality of injectors~~ located proximate to the throat ~~, the second plurality of injectors having port openings arranged along the inside surface opposite of the plurality of injectors, the second plurality of injectors arranged such that the second plurality of injectors are not aligned parallel to the path of the primary flow of fluid, each of the second plurality of injectors adapted to expel the injection fluid in a second direction within the enclosed volume, the second direction inclined to oppose the primary flow of the fluid and approximately parallel to the intended vectoring plane~~.

57. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 56 wherein the plurality of primary and/or supplemental injectors ~~and the second plurality of injectors expel the injection~~ inject fluid symmetrically, resulting in a change in a discharge coefficient ~~in~~ for the nozzle.

58. Cancelled.

59. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 51 wherein the ~~injection~~ injected fluid ~~is a~~ comprises compressed gas.

60. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim 51 wherein the ~~injection~~ injected fluid ~~is~~ comprises fuel.

61. (Currently Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim ~~54~~ 53, ~~the nozzle~~ further comprising:

~~the~~ at least one controller, operable to direct ~~at least one of the plurality of~~ said primary and/or supplemental injectors ~~to expel the injection fluid~~.

62. (Amended) The ~~nozzle~~ system for vectoring a primary flow of Claim ~~51~~ 61, ~~the nozzle further comprising:~~

wherein said ~~the~~ at least one controller, ~~operable to direct~~ directs ~~at least one of the plurality of~~ said primary and/or supplemental injectors to ~~expel of the injection~~ inject fluidic ~~fluid in~~ pulses.

63. (Currently Amended) A method for vectoring a primary flow ~~of fluid in a nozzle, the nozzle having a throat, the throat comprising a region within the nozzle of lowest cross-sectional area, the throat being situated in a path of the primary flow of fluid, the method~~ within a nozzle comprising the steps of:

~~expelling~~ injecting from a plurality of primary injectors ~~an injection~~ a fluid ~~in a direction inclined to oppose~~ opposed to the primary flow ~~of the fluid and approximately parallel to an intended vectoring plane, the~~ wherein said plurality of primary injectors are located proximate to ~~the~~ a throat ~~and arranged such that the plurality of injectors are not aligned parallel to the path of the primary flow of fluid~~ of the nozzle~~.~~;

injecting from a plurality of supplemental injectors fluid to oppose the primary flow, the plurality of supplemental injectors located downstream of the throat, wherein said injected fluid skews or varies an effective throat or sonic plane within the nozzle.

64. Cancelled.

65. (Currently Amended) The method of Claim 63, ~~the method further comprising:~~

~~expelling from a second plurality of injectors an injection fluid in a direction inclined to oppose the primary flow of the fluid and approximately parallel to an intended vectoring plane, the second plurality of~~ wherein said supplemental injectors are located proximate ~~approximate~~ to the throat ~~and arranged such that the second plurality of injectors are not aligned parallel to the path of the primary flow of fluid~~.

66. (Currently Amended) The method of Claim 63 wherein ~~the step of expelling comprises expelling in~~ fluid is injected as fluidic pulses.

67. (Currently Amended) The method of Claim 63 wherein the ~~injection~~ injected fluid ~~is a~~ comprises compressed gas.

68. (Currently Amended) The method of Claim 63 wherein the ~~injection~~ injected fluid ~~is a~~ comprises fuel.

69. Cancelled.

70. (Withdrawn) A method for designing a nozzle, the method comprising:

analyzing a baseline configuration of the nozzle;

establishing a design study matrix of experimental configurations, the design study matrix comprising the experimental configurations, each of the experimental configurations being different by at least one value of one or more matrix variables;

conducting computational fluid dynamic analysis on the experimental configurations;

identifying effects of the matrix variables on behavior of the experimental configurations;

constructing an enhanced configuration; and

evaluating the enhanced configuration.

71. (Withdrawn) The method of Claim 70 wherein the nozzle is of a jet engine.

72. (Withdrawn) The method of Claim 70 wherein the nozzle is a high aspect ratio nozzle.

73. (Withdrawn) The method of Claim 70 wherein the step of evaluating the enhanced configuration comprises performing at least one thrust stand test.

74. (Withdrawn) The method of Claim 70 wherein the behavior of the experimental configurations is selected from a group consisting of thrust vectoring angle, thrust efficiency, and discharge coefficient.

New

75. (~~Not Entered~~) The system of Claim 31, wherein a location, size, and/or orientation of said effective throat are varied.-

New

76. (~~Not Entered~~) The system of Claim 31, wherein a fluidic pulse from said at least one supplemental injector is operable to skew a boundary of the sonic plane of the primary flow towards said at least one supplemental injector.

see fax of 3/5/04 for clarification of the status.

77. (~~Not Entered~~) The system of Claim 31, wherein the primary flow has a temperature and wherein said pulsed secondary flow throttles the primary flow by decreasing the effective cross sectional area of the effective throat to control said temperature of the primary flow.

78. (New) A system for vectoring a primary flow in three dimensions by varying an effective throat or sonic plane within a ducted primary flow, comprising:

an opening for accepting the primary flow;

at least one primary injector located wherein said at least one injector is inclined to oppose the primary flow up-stream of said effective throat or sonic plane;

at least one supplemental injector and wherein said at least one supplemental injector is located downstream of the at least one primary injector, wherein said at least one supplemental injector opposes the primary flow in the intended vectoring plane, wherein said injector opposes the primary flow and wherein the at least one primary and supplemental injectors provide a flow field opposed to a subsonic portion of the primary flow in order to vector the primary flow; and

at least one controller operable to direct said at least one primary and supplemental injector to provide a flow operable to vary the effective throat or sonic plane.

79. (New) A method for vectoring a primary flow of fluid in a 3-D nozzle, comprising the steps of:

injecting fluid from a plurality of primary injectors wherein said injectors are opposed to a primary flow of the fluid and parallel to an intended vectoring plane, the plurality of injectors located proximate to a throat;

injecting fluid from a plurality of supplemental injectors opposed to the primary flow wherein said second plurality of supplemental injectors are located downstream of the throat, and wherein the fluid injected by said primary and/or supplemental injectors varies or skews in three dimensions an effective throat or sonic plane of said 3-D nozzle.

80. (New) A system for vectoring a primary flow comprising:

a three dimensional nozzle having an inner surface and a throat, wherein the throat comprises a region within the three dimensional nozzle of lowest cross-sectional area, the throat being situated in a path of the primary flow of fluid;

a plurality of primary injectors arranged along the inner surface of the three dimensional nozzle, the plurality of injectors are individually arranged to oppose the primary flow of fluid in a first intended vectoring plane, and wherein said primary injectors skew an effective throat or sonic plane within said three dimensional nozzle.

81. (New) A method for vectoring a primary flow within a three dimensional nozzle comprising the steps of:

injecting from a plurality of primary injectors a fluid opposed to the primary flow wherein said plurality of primary injectors are located proximate to a throat of the nozzle;

injecting from a plurality of supplemental injectors fluid to oppose the primary flow, the plurality of supplemental injectors located downstream of the throat and are individually aligned to oppose said primary flow , wherein said injected fluid skews or varies an effective throat or sonic plane within the three dimensional nozzle.

82. (New) A method for designing a nozzle, the method comprising:

analyzing a baseline configuration of the nozzle;

establishing a design study matrix of experimental configurations, the design study matrix comprising the experimental configurations, each of the experimental configurations being different by at least one value of one or more matrix variables;

conducting computational fluid dynamic analysis on the experimental configurations;

identifying effects of the matrix variables on behavior of the experimental configurations;

constructing an enhanced configuration; and

evaluating the enhanced configuration.